SIXTH QUARTERLY ACTIVITIES REPORT
ON THE
COOPERATIVE AGREEMENT NO. 391-0467-A-00-1818-00

IRRIGATION RESEARCH

(Period from December 1992 to February 1993)

PART I: IRRIGATION SYSTEMS MANAGEMENT RESEARCH PROJECT
PART I

IRRIGATION SYSTEMS MANAGEMENT RESEARCH PROJECT

INTRODUCTION

This sixth quarterly activities report covers the period from December 1992 to February 1993. During this period IIMI further intensified its provision of technical assistance to collaborating institutions in data collection and analyses, and in writing quality symposium papers and reports on the different studies. IIMI organized and held the Second Biannual ISM/R Progress Review Meeting at the Avari Hotel in Lahore on 25 January 1993. Important details on the preparation of the 11-13 April ISM/R Symposium were also discussed during the meeting. A revised Symposium program was distributed and an absolute deadline set for submission of drafts of papers.

During the period under review, two physical hydraulic modeling studies were started by the Directorate of Hydrology and Research in the Sindh. Five officers from the same Directorate completed their training in hydraulic monitoring, physical hydraulic modeling, and water quality testing in Lahore. Assistance was provided to NARC in implementing a two-week course on sprinkler and trickle irrigation for forty participants on 9-21 January 1993, and in formulating and arranging a one-week course on surface irrigation for forty to fifty officials and farmers to be held at NARC, Islamabad on 17-22 April 1993.

PROGRESS OF ACTIVITIES

As in previous reports, this report features a chronology of interaction visits and meetings, including significant events in implementing the various activities of the ISM/R component of the CA as shown in Attachment A.

The Second Biannual ISM/R Progress Review Meeting was held on 25 January 1993 from 9:00 A.M. to 4:00 P.M. at the Avari Hotel in Lahore. The chairman of the meeting was Dr. E. J. Vander Velde (EJV), Acting Director of IIMI-Pakistan after Dr. J. W. Kijne was appointed Director of Research of IIMI in Colombo. EJV introduced Mr. Javed Saleem Qamar, General Manager (Planning) WAPDA, who also chairs the Cooperative Agreement Planning and Review Committee, and Mr. Jan P. Emmert, Chief of the Water Resources Division of USAID. EJV also welcomed the 50 participants.

Fifteen to twenty minutes were allotted for each subproject. This included an overview by the subproject leader and individual presentations by the principal investigators and senior and junior research officers. For each study, a brief
statement was given on the objectives, findings, conclusions, current status of data collection and analysis, paper and report writing, and future plans. The presenters were requested to focus on what had been accomplished since the First Biannual Meeting held on 24 September 1993.

As in the first meeting, the order of presentation was as follows:

1. Integrated watercourse management
2. Farm water management
3. Beyond watercourse improvement
4. Irrigation systems outside the Indus Basin
5. Development of ground and surface water models
6. Public and private tubewell performance
7. Improving efficiency of on-farm water use and application
8. Encouraging water users associations
9. Surface drainage and water table control program

Messrs. Abdullah Khan and Waryam Ali Mohsin gave an overview of the status and plans for each of the subprojects on the first two subprojects on "Integrated watercourse management" and "Farm water management" which are being done in Mona and LIM, respectively. They then asked their respective staff to present the individual studies: Messrs, Ghulam Mohy-ud-Din, Zahir Piracha, and Abdul Ghaffar for Mona; and Messrs. Mumtaz Ali Burjao and Abdul Hameed for LIM.

While acknowledging the inclusion of economic analysis in evaluating the technologies being generated in some of the studies at Mona, Mr. Jan Ernmert raised the management issue of the organizational and institutional arrangements needed to move potentially useful findings to practical applications by end users. Mr. Khan stated that Mona has been trying to address this issue by including in its activities a plan for his staff to conduct research beyond the Mona Project area.

Mr. Bashir Ahmad, WCMED Project Director, reported on the lone study under the subproject on "Beyond watercourse improvements." When he finished, Prof. Arshad
Ali and Dr. Shahid Ahmad suggested that it would be desirable to compare the findings of similar work done elsewhere in the past.

Mr. Khalid Javed Upal, PD(S) Acting Project Director, introduced Messrs. Mushtaq Ahmed, Mohammed Khalil and Riaz Ahmad to report on the subproject on "Irrigation systems outside the Indus basin." While commending the impact of the improvements done on the karezes, Dr. Bashir Chandio questioned the economic viability of the recommended development measures to rehabilitate karezes in the face of an observed decreasing karez area and increasing drilled and dug wells. The Chair expressed the view that the forthcoming April symposium would be the more appropriate time and venue for a thorough discussion of these questions. On a query about the fate of two studies on the "Installation of low head bubbler in Mastung area" and the "Experimental improvement of one irrigation scheme in the Northern area" which were not reported but were listed as activities of the new PIL of WAPDA, Mr. Ahmed replied that the studies will be carried out.

Mr. Muhammad Munir, Chief Engineer of P&l WAPDA, summed up the work being conducted by the WAPDA institutions under his office. He expressed satisfaction with the useful findings coming out of the studies, especially from Mona and PD(S), and that 33 technical reports and 14 Symposium papers are expected to be prepared and completed.

For the subprojects on "Developments of ground and surface models" and "Public and private tubewell performance," Mr. Yaqoob Khan, SMO Chief Engineer, called on Messrs. Javed Zaman, Farhat Zaman, Imtiaz Ali, Parvez Arif and Mohammad Memon to present their respective studies.

Dr. Shahid Ahmad, Director of the WRRI, NARC, started with a discussion of the continuum of technology generation to adoption by various end users in introducing the different studies under the subproject on "Improving efficiency of on-farm water use and application." In the trickle and sprinkler irrigation studies, he emphasized the aspect of indigenization in the manufacture of the components needed for systems installation. He requested Prof. Arshad Ali to report on the border irrigation study being conducted by a number of principal investigators in various parts of the country.

Dr. Bashir Chandio, PCRWR Chairman, gave an overview of the subprojects on "Encouraging water users associations" and the "Surface drainage and water table control program." He reported on the activities going on in the Qadirabad and Drush Khela areas, the two sites of the first subproject. For the second subproject, Mr. Muhammad Khan Marri of DRIP discussed the various pilot tile drainage units being monitored including the ones currently being installed. He also mentioned some problems connected with the tile drainage laying machine being used in the Jacobabad site.
Mr. Shamim-ud-din Ahmed, Deputy Director, Directorate of Hydrology of the SID in Hyderabad, presented the physical hydraulic modeling studies recently started on sediment excluders/ejectors and the effect of downstream glacis slope on scour. He showed some slide pictures of the modeling setups.

The Chair requested SMM to lead the review on the preparations for the ISM/R Symposium. The group went over the tentative program on such items as the venue, dates, timing, titles of papers, authors, etc., and the list of participants. Any change in title/author(s), deletion/addition of papers was requested to be submitted or communicated before participants left the meeting venue. It was also agreed to hold a technical session on "Irrigation Management Research Agenda of Pakistan for the Future" to precede the closing session. Paper presenters would include Dr. Bashir Chandio who would present the view from PCRWR; from WAPDA, Mr. Muhammad Munir; from PARC, Dr. Shahid Ahmad; and from IIIMI for the global view, Dr. Jacob Kijne. (The revised symposium program incorporating the suggested changes is shown in Attachment B).

The absolute deadline for receipt of the final drafts of papers by IIIMI was set on 14 February 1993 so that the papers could be edited, printed and bound to be ready for distribution before the symposium date. The Chair strongly supported the deadline set.

Mr. Emmert, who was leaving Pakistan soon for a new assignment, introduced Mr. Muzammil Hussain Qureshi, currently Chief Engineering Advisor, who will take over Mr. Emmert's job as Chief of the Water Resources Division in a concurrent capacity.

Other activities during the period under review included a meeting between IIIMI staff (SMM and BAS) and Mr. Shamim-ud-din Ahmed of the Directorate of Hydrology and Research in the Sindh. They reviewed the good progress being made on the physical modeling of sediment ejectors for the Jamrao canal and the effect of downstream glacis slope on scour. The study on hydrological data and monitoring of irrigation water in the Sindh province is still awaiting the return of staff being trained with ACOP-WAPDA and the delivery of research equipment still being procured. IIIMI staff (BAS) arranged with the Irrigation Research Institute, Lahore the training of two Directorate officers on hydraulic modeling; with ACOP-WAPDA the training of two officials on hydraulic monitoring; and with the Land Reclamation Directorate, Punjab, the training of one official on water quality testing. All five officers received their certificates of completion on 14 February 1993 at the ACOP-WAPDA office.

A 2-week training on the design and operation of sprinkler and trickle irrigation was held on 8 to 21 January 1993 at the NARC Training Institute in Islamabad in which SMM, MAB, and MK participated as resource persons for IIIMI. Participation was not restricted to ISM/R collaborators only. The forty participants came from various agencies which are currently engaged in sprinkler and trickle research and development such as the OFWM project, university and NGO staff, and some farmers.
MA6 also provided assistance in developing an expanded version of the on-job training course on surface irrigation held at the University of Agriculture, Faisalabad, in June, 1992. The one-week course is being organized for 40 to 50 participants to meet the greater demand and benefit a wider audience. The course is scheduled to be held at the NARC training facilities on 17-22 April 1993.

As stated earlier, the significant interactions between IIMI staff and research staff of collaborating Pakistani institutions during the sixth quarter were mostly on the preparation of draft ISM/R Symposium papers and final reports. The interactions consisted mainly of reviewing format, content, outline, initial draft, advanced draft and final version of papers preliminary to printing.

In the case of Mona, SMM, MK, MAB and EVW had several discussions with Messrs. Ghulam Mohy-ud-Din, Mohammad Iqbal, Saddique Rafiq and Zahir Ahmad Piracha on their draft papers. Dr. Ramzan Chaudhry of IWASRI was invited to join the discussion on the three studies under the subproject on "Farm Water Management." With IIM, MK met with Mr. Abdul Hameed, and SMM and PS with Mr. Mumtaz Ali Burpio on their draft papers.

On 1 February 1993, the contract for printing 80 copies of the report on the "Plan and Rehabilitation and Improvement of Karezes in Balochistan" was awarded by IIMI in the presence of CGR and Mr. Mushtaq Ahmed of PD (S). On the draft papers prepared by Messrs. Ijaz Humayun, Mushtaq Ahmed, Muhammad Khalil and Fiaz Ahmad, CGR and MK had several sessions with the second author, and PS and MAB with the last two authors, respectively.

Some of interactions of EJV and MB with SMO involved the organization of an Experts Meeting to advise on data analysis in establishing the possible causes of tubewell deterioration. ZH provided assistance in installing softwares on graphics and training on computer virus checking and cleaning to SMO computer users. As in the previous quarter, weekly sessions (4-6 hours each) were held between MN and the SMO staff engaged in the groundwater modeling work. The preparation of papers for the April Symposium continues to be a major part of the interaction. MB had several intensive sessions with Messrs. Mohammad Memon and Parvez Arif; MN with Messrs. Javed Zaman, Farhat Zaman and Imtiaz Ali.

In January, DTB met with Dr. Munir Bhatti at the IIMI-Pakistan Office, Lahore, to work together on the paper on the Qadirabad pre-project socio-economic study, and to review the draft on the synthesis study. Further discussions on the same papers were held with Dr. Chandio during the ISM/R Biannual Meeting. SMM discussed with Dr. Chandio the desirability of preparing a symposium paper on the "Boundary Effects on Seepage Interception Using the Galerkin Finite Element Model."

By the end of February, IIMI received the following Symposium papers:
Lessons Learned on Mechanized Construction and Maintenance of Earthen Watercourse

Buried Pipeline Irrigation System and Its Impact on the Farm Economy

Procedure for Adjusting Cropping Pattern to Irrigation Supplies

Manually Installed Tile Drainage System - Its Effect and Economics

Water Management Strategies under Shallow Water Table Conditions (Mona and LIM)

Use of Brackish Groundwater for Crop Production

Augmentation/Conjunctive Use of Surface and Groundwater Through Fractional Wells

Flow Variations in Distributaries and Reachwise Supply to Outlets

Effect of Karez Improvements, Rehabilitation and Future Development Plan in Balochistan

Advanced Irrigation Techniques and Their Use in Balochistan

Delay Action Darns in Ziarat Valley - An Estimation of Economic Impact

Effect of Brackish Water and Phosphorus on Yield of Onion

Estimation of Hydrologic Parameters for Regional Groundwater Models

An Appraisal of Groundwater Pollution in Allahabad Unit, SCARP-VI

Interaction of Saline and Fresh Water Zones in Allahabad Unit, SCARP-VI

Groundwater Quality Changes in Allahabad Unit, SCARP-VI

Classification of SCARP Tubewells in the Data Base by Their Characteristics and Performance Record

Level Borders Irrigation Application Efficiency Under Different Soil Surface Conditions

Level Border Irrigation Layout and Evaluation in Pakistan

Innovative Surface Irrigation Methods for Orchards
* Benefits of Supplemental Irrigation for Wheat in Barani Environment
* Design and Local Manufacturing of Raingun Sprinkler Irrigation Systems
* Indigenization of Trickle Irrigation Technology
* Potential Role of Water Users Associations for Better Water Management at the Farm Level: Synthesis of Nine Studies

In late February, USAID updated IIMI on the progress being made on the procurement of research equipment for the components of PARC and the Directorate of Hydrology and Research in Sindh. The information was relayed to the two organizations.

PROBLEMS

As reported in the last quarterly activities report, the much delayed procurement of research equipment by the Commodities Division of USAID for PARC and the Directorate of Hydrology and Research in Sindh has adversely affected the implementation of some projected studies. The funding arrangements for the three studies being conducted by the Directorate of Hydrology and Research in the Sindh continue to be unclear due to not knowing the exact amount that could be made available as savings from the purchase of research equipment.

FUTURE PLANS

For the seventh quarter of the Project (March to May 1993), IIMI will further intensify its provision of technical assistance to collaborating institutions in the writing of quality technical reports and Symposium papers for the different studies. The organization and detailed preparations for the 11-13 April 1993 ISM/R Symposium to be held at the Punjab Engineering Academy in Niat Beg, Lahore will be a major preoccupation. As agreed with PARC, IIMI will provide assistance in jointly organizing and offering an expanded one-week training course on surface irrigation to be held on 17-21 April 1993 at NARC, Islamabad. The preparation of a final report of all activities under the ISM/R Project and submission of the same to the USAID will be the culminating activity.

The advisability of holding a final meeting of the CA Planning and Review Committee before the Project's completion at the end of May 1993 will be discussed with the Chairman.
## CHRONOLOGY OF INTERACTION VISITS AND MEETINGS IN IMPLEMENTING THE ISM/R COMPONENT OF THE CA

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of Interaction</th>
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<tr>
<td>25 January</td>
<td>Participation of all IIMI staff providing technical assistance to the ISM/R Project in the Second Biannual Progress Review Meeting held at the Avari Hotel in Lahore. Likewise, USAID and all the collaborating institutions in the ISM/R Project were represented. The meeting was chaired by EJV, Acting Director, IIMI-Pakistan. A brief overview, presentation and discussion of each subproject and study began promptly at 9:00 A.M. Those making the presentation were requested to focus on what was accomplished since the First Biannual Meeting held on 24 September 1992.</td>
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<td><strong>A discussion</strong> followed, led by SMM, on the preparations for the 11-13 April 1993 Symposium to be held at the Punjab Engineering Academy at Niaz Beg, Lahore.</td>
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<tr>
<td>3 February</td>
<td>Distribution of Highlights of the Second ISM/R Biannual Meeting to participants.</td>
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<tr>
<td>17 February</td>
<td>Meeting of SMM and BAS with Mr. Tahir Malik, Principal, Punjab Engineering Academy, and his concerned staff to finalize arrangements for the ISM/R Symposium on 11-13 April 1993.</td>
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<tr>
<td>21 February</td>
<td>Submission by SMM to USAID of the 5th Quarterly Activities Report on the ISM/R.</td>
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<tr>
<td><strong>Mona Project</strong></td>
<td>Early December Review by EVW of draft report on the study &quot;Matching of Cropping Pattern with Water Supply,&quot; His comments and suggestions were mailed to Mr. Ghulam Mohy-ud-Din.</td>
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25 January  
Receipt by EVW of revised draft of paper prepared by Mr. Mohy-ud-Din on "Procedure for Adjusting Cropping Pattern to Irrigation Supplies" in which he had incorporated most of EVW's comments and suggestions.

26 January  
Meeting of EVW with Mr. Mohy-ud-Din on some minor editing on the draft paper. MAB reviewed with Mr. Mohy-ud-Din the draft paper on "Lessons Learned on Mechanized Construction and Maintenance of Earthen Watercourse."

26-27 January  
Detailed discussions of MK with Messrs. Mohammad Iqbal and Saddique Rafiq of Mona and Dr. Ramzan Chaudhry of IWASRI on three studies being undertaken by Mona: "Water Management Strategies under Shallow Water Table Conditions," "Salt Balance at Rootzone," and "Effect of Brackish Water on Crop Production."

17 February  
Receipt through Mr. Afzal Javaid, Deputy Director, P&I, WAPDA, of the following ISM/R symposium papers submitted by Mona Project staff:

* Lessons Learned on Mechanized Construction and Maintenance of Earthen Watercourse

* Buried Pipeline Irrigation System and Its Impact on the Farm Economy

* Procedure for Adjusting Cropping Pattern to Irrigation Supplies

* Manually Installed Tile Drainage System - Its Effect and Economics

The symposium papers were distributed for final review to corresponding IIIMI staff providing technical assistance.

IIIMI

26 December  
Meeting of MK with Mr. Waryam Ali Mohsin at the IIIMI-Pakistan office about three draft Symposium papers.

14 January  
Visit of SMM to the LIM campus in Hyderabad to review with Messrs. Ali Mohsin, Mumtaz Ali Buriro and Abdul Hameed the progress on revising the three draft papers.
24 January Meeting of MK with Messrs. Ali Mohsin and Hameed on two studies: "Water Management Strategies for Areas with Poor Drainage or Shallow Water Table Conditions" and "Use of Brackish Groundwater for Crop Production;" and SMM with Mr. Ali Buriro on "Augmentation/Conjunctive Use of Surface and Groundwater Through Fractional Skimming Wells."

16 February Submission to MK of two Symposium papers by Mr. Abdul Hameed for final review prior to printing.

22 February Request of SMM to PS to travel to the LIM Campus in Hyderabad to work with Mr. Ali Buriro in strengthening the economic analysis and write up of the latter's Symposium paper.

WM&ED

Dec-Jan Meetings of MA8 with WM & E staff to review the progress made on the data analysis and interpretation of results, writing of report and preparation of draft of Symposium paper in the study on "Existing Flows in Watercourses as Compared to Design Discharges."

17 February Receipt by SMM of draft Symposium Paper on "Flow Variations in Distributaries and Reachwise Supply to Outlets." References on similar studies were discussed by SMM with Mr. Bashir Ahmad. It was suggested to add another table on the performance of different types of outlets.

PD(South)

15 December Meeting of CGR with PD(S) staff on the procedures to be followed in the printing of the Karez Report for the Government of Balochistan.

6 January Meeting of CGR and MAB with Mr. Riaz Ahmad to discuss the draft paper on "Effect of Brackish Water and Phosphorus on Yield of Onion."

25 January Brief discussions of CGR with PD(S) staff while attending the 2nd ISM/R Biannual Meeting at the Avari Hotel in Lahore.

28 January Participation of CGR and SMM with Mr. Ahmed of the PD(S) and IIMI support staff in finalizing the award of the contract for printing the Karez Report.
1 February  Meeting of CGR with Mr. Ahmed to discuss in detail the former's comments and suggested changes on the paper "Effect of Karez Improvement and Future Plan for Improvement in Balochistan."

18 February  Receipt by SMM from Mr. Ahmed the following draft Symposium papers for review and editing of IIMI TA team (CGR, MK, PS, MAB) prior to printing:

* Effect of Karez Improvements, Rehabilitation and Future Development Plan in Balochistan

* Advanced Irrigation Techniques and Their Use in Balochistan

* Delay Action Dams in Ziarat Valley - An Estimation of Economic Impact

* Effect of Brackish Water and Phosphorus on Yield of Onion

20 February  Meeting of PS with Mr. Muhammad Khalil from PD(S) to review the paper on "Delay Action Dams." Comments and suggested final outline were given to Mr. Khalil.

23 February  Meeting of MK with Mr. Ahmed on the draft Symposium paper on "Advanced Irrigation Application Methods and Their Use in Balochistan."

28 February  Submission by CGR for presentation in the Symposium of final draft of paper on "Effect of Karez Improvements, Rehabilitation and Future Development Plan in Balochistan."

SMO

5 December  Meeting of MB with Mr. Mian Saeed Hussain at the IIMI-Pakistan office for the organization of an Experts Meeting to be organized by IWASRI.

6 December  Visit of MB to SMO to advise Mr. Muhammad Memon on the approach to be followed if work relating to bio-fouling as a cause of tubewell deterioration was to be taken up. Work in hand by Mr. Parvez Arif on data analysis was reviewed.

14 December  Participation of EJV and MB in the well-attended Experts Meeting at IWASRI to advise on data analysis to establish possible causes of tubewell deterioration.
22 December  Visit of MB to SMO to review with Mr. Memon the draft report on tubewell rehabilitation work. Guidelines for the report and also for the Symposium paper were given to Mr. Memon.

3 January  Assistance provided by MB to Mr. Parvez Arif who dropped by the IIIMI-Pakistan Office to get access to a Graphics Computer Program for the work he was doing.

4 January  Visit of ZH to SMO to assist Mr. Arif in installing two software packages, HARVARD GRAPHICS AND F-PORT (a virus scanner and cleaner), in SMO computers.

5 January  Visit of MB and ZH to SMO. ZH assisted Mr. Arif in tackling the virus problem in computers. ZH also provided short training to SMO computer users on virus checking and cleaning. MB discussed with Mr. Yaqoob Khan, SMO Chief Engineer, the issues involved in taking up additional work on tubewell rehabilitation. Mr. Khan indicated that he would raise the matter during a meeting with USAID the next day.

6 January  Meeting of EJV and MB at the IIIMI-Pakistan office with Mr. Jan Emmert of USAID to discuss matters pertaining to SMO work.

7 January  Meeting of MB with Mr. F. M. Nasir of IWASRI on the minutes of the 14 December Experts Meeting at IWASRI.

18 January  Provision by ZH to Mr. Arif of a few files of the software packages given earlier which were damaged by computer viruses and not working properly.

23 January  Meeting of MB with Messrs. Memon and Arif to review the format and content of the Symposium papers.

4 February  Review by MB of first drafts of Symposium papers prepared by SMO staff.

7 February  Decision by MB in consultation with EJV to advise Mr. Arif to change the subject of the latter’s paper on database with a revised classification of data.

9 February  Meeting of MB with Mr. Arif to review the outline of Mr. Arif’s paper.
17 February Receipt by SMM from MN the following drafts of Symposium papers for review and editing prior to printing:

* Estimation of Hydrologic Parameters for Regional Groundwater Models

* An Appraisal of Groundwater Pollution in Allahabad Unit, SCARP-VI

* Interaction of Saline and Fresh Water Zones in Allahabad Unit, SCARP-VI

* Groundwater Quality Changes in Allahabad Unit, SCARP-VI

18 February Lengthy session of MB with Mr. Muhammad Memon regarding Mr. Memon's Symposium paper which involved a restructuring of the original paper.

22 February Meeting of MB with Mr. Arif to review the latter's drafts.

Dec-Feb Weekly sessions (4-6 hours each beginning this period) by MN with Messrs. Javed Zaman, Farhat Zaman and Imitiaz Ali on the subproject on "Development of groundwater models." Advice has been provided on the use of the database prepared by SMO. The preparation of papers for the April Symposium has been a major part of the interaction.

PARC

9 January Participation of SMM and MAB in the opening ceremony of the two-week on-job training course on sprinkler and trickle irrigation systems held at the NARC Training Institute in Islamabad. SMM gave a presentation on IIMI and its role in the ISM/R; MAB lectured on soil-plant-water relationship.

10 January Meeting of SMM with Dr. Shahid Ahmad about budget matters and the latest report on the procurement of research equipment by the Commodities Division of USAID

12-14 January Participation of MK in the training course on sprinkler and trickle irrigation systems.

21 January Attendance of SMM and MAB in the closing ceremony of the course on sprinkler and trickle irrigation Systems.
Meetings of MAB with Dr. Ahmad, Director, WRRI, NARC, and his Deputy Director, Mr. M. Yasin, on the detailed program and organization of the one-week on-job training course on surface irrigation systems to be held at the NARC Training Institute on 17-22 April 1993. The course is an expanded version of the on-job training held at the University of Agriculture, Faisalabad, in June, 1992, which is intended to benefit a much wider participation. About 40 to 50 participants are expected.

17 February Receipt by SMM of the Symposium paper prepared of Prof. Badruddin and Dr. M. Jamal Khan on "Level Borders Irrigation Application Efficiency Under Different Soil Surface Conditions."

18 February Follow-up telephone conversation of SMM with Dr. Ahmad about the Symposium papers being prepared by NARC.

23 February Receipt by SMM of the following draft Symposium papers from Mr. Yasin:

* Innovative Surface Irrigation Methods for Orchards
* Benefits of Supplemental Irrigation for Wheat in Barani Environment
* Design and Local Manufacturing of Raingun Sprinkler Irrigation Systems
* Indigenization of Trickle Irrigation Technology

PCRWR

December Visit of DTB to PCRWR in Islamabad to discuss with Dr. Munir Bhatti and his colleagues the two Symposium papers on "Encouraging Water Users Associations - Phase II," and finalize outlines.

January Meeting of DTB with Dr. Bhatti at the IIIMI-Pakistan office to work together on the paper on the Qadirabad pre-project socio-economic study, and to review the draft on the synthesis study. Further discussions on both papers were held with Dr. Chandio during the ISM/R Biannual Meeting.

25 January Meeting of SMM with Dr. Chandio on the desirability of preparing a symposium paper on the "Boundary Effects on Seepage Interception
Using the Galerkin Finite Element Model."

February  
Review by DTB of the second drafts of the two EWU papers and exchange of views with PCRWR staff.

14 January  
Joint visit of SMM and BAS to the DRIP campus in Tando Jam. Met with Messrs. Haroon Chang and Muhammad Khan Marri on the preparation of papers for the Symposium and the progress of the new pilot tile drainage site in Jacobabad.

18 February  
Follow-up telephone conversation of SMM with Mr. Moulta Bux Mirbahar about the Symposium papers being prepared by DRIP.

24 February  
Receipt by SMM of final draft paper on "Potential Role of Water Users Associations for Better Water Management at the Farm Level: Synthesis of Nine Studies." The draft was passed on to DTB for review.

DHR-Sindh

20 December  
Deployment by BAS of 5 Research Officers from the Directorate of Hydrology and Research to report for training at the Irrigation Research Institute (IRI), Punjab, Land Reclamation Directorate (LRD), Punjab, and ACOP-WAPDA.

10 January  
Meeting of BAS with Dr. Moharam Irshad and Mr. Karamat Ali, Director, LRD, Punjab, to monitor the progress of the training of the officers of the Sindh Hydrology Directorate.

12-14 January  
Joint visit of SMM and BAS to the Sindh Hydrology Directorate to review the progress of ongoing physical hydraulic modeling studies and the status of the proposed study dealing with collection of hydrological data and monitoring of irrigation water in Sindh. Discussed with Messrs. Shamim-ud-din Ahmed and Manzoor Ahmed Shaikh the 25 January 1993 ISM/R Biannual Meeting in Lahore, preparation of papers for the April Symposium and submission of final reports on the studies before the end of May. Briefed them also on the status of research equipment procurement.

25 January  
Assistance given by BAS to Mr. Ahmed during the latter's presentation in the 2nd ISM/R Biannual Meeting on the progress of two physical hydraulic modeling studies being done by the Directorate.
28 January  Meeting of BAS with Mr. Abdul Mujib, Deputy Director, ACOP-WAPDA, to review the progress of training of two Directorate officers.

14 February Certificate distribution ceremony attended by SMM and ZH to mark the formal completion of the training of 5 Directorate officers at the ACOP-WAPDA main office.

List of Acronyms

BAS  Bagh Ali Shahid
CGR  Carlos Garces-Restrepo
DRIP  Drainage Research Institute of Pakistan
DTB  D. T. Bandaragoda
EJV  Edward J. Vander Velde
EVW  Erik Van Waijjen
JWK  Jacob W. Kijne
LIM  Lower Indus Water Management and Reclamation Research Project
MAB  Muhammad Akhtar Bhatti
MB  M. Badruddin
MK  Marcel Kuper
MN  M. Nadeem
Mona  Mona Reclamation Experimental Project
P&I WAPDA  Planning and Investigation, Water and Power Development Authority
PARC  Pakistan Agricultural Research Council
PCRWR  Pakistan Council for Research on Water Resources
PD(S)  Planning Directorate (South)
PS  Pierre Strosser
SID  Sindh Irrigation Department
SMM  Senen M. Miranda
SMO  SCARP Monitoring Organization
WM&ED  Watercourse Monitoring and Evaluation Directorate
ZH  Zaigham Habib
IRRIGATION SYSTEMS MANAGEMENT RESEARCH (ISM/R) SYMPOSIUM
11-13 April 1993
Government Engineering Academy Punjab
Niaz Beg, Lahore, Pakistan

PROGRAM

10 April (Saturday)
Arrival of participants from outside of Lahore and hostel check-in

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<th>Time</th>
<th>Activity</th>
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<td>1700</td>
<td>Registration</td>
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<td>1900</td>
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11 April (Sunday)
Inaugural Session

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<th>Time</th>
<th>Activity</th>
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<tr>
<td>0745</td>
<td>Registration</td>
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<td>0830</td>
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<tr>
<td>0845</td>
<td>Guests to be seated</td>
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<tr>
<td>0855</td>
<td>Arrival of the Chief Guest, Mr. Nadir Parvez, Minister of State for Water and Power</td>
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<tr>
<td>0900</td>
<td>Recitation from the Holy Quran</td>
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<td>0905</td>
<td>Welcome Address by Mr. Khalid Mohtadultzah, Deputy Director General, IIMI</td>
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<td>0910</td>
<td>Keynote Address by Mr. Shams ul Mulk, Member (Water), WAPDA</td>
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<td>0920</td>
<td>Address by Mr. Arnold J. Radi, Chief, Agriculture and Rural Development, USAID</td>
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<td>0930</td>
<td>Inaugural Address by the Chief Guest</td>
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<td>0940</td>
<td>T E A</td>
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Technical Session I:

INTEGRATED WATERCOURSE MANAGEMENT

Chairman: Mr. Abdullah Khan
Rapporteur: Mr. Erik van Waijen

1020 Lessons Learned on Mechanized Construction and Maintenance of Earthen Watercourse
Ghulam Mohy-ud-Din and Mohammad Hanif

1040 Buried Pipeline irrigation System and Its Impact on the Farm Economy
Zahir Ahmad Piracha, Abdul Ghaffar, Muhammad Rafique Gill, and Muhammad Arif

1100 Augmentation/Conjunctive Use of Surface and Groundwater Through Fractional Skimming Wells
Mumtaz Ali Buriro and Waryam Ali Mohsin

1120 Pattern of Flow Variation in Distributaries and Reachwise Supply to Outlets
Bashir Ahmad, Mian Asghar Ali and Akhtar Raza Ahmad Khan

1140 Procedure for Adjusting Cropping Pattern to Irrigation Supplies
Ghulam Mohy-ud-Din and Muhammad Hanif

1200 Manually Installed Tile Drainage System - Its Effect and Economics
Zahir Ahmad Piracha, Abdul Ghaffar and Muhammad Rafique Gill

1220 Discussion

1300 LUNCH & PRAYERS

1420
Technical Session II:

FARM WATER MANAGEMENT

Chairman: Dr. Jacob W. Kijne
Rapporteur: Dr. Ramzan Chaudhry

1420 Use of Brackish Groundwater for Crop Production
Abdul Hameed and Muhammad Qaim Channa

1440 Water Management Strategies Under Shallow Watertable Conditions
Muhammad Iqbal

1500 Water Management Strategies for Areas with Poor Drainage or Shallow Watertable Conditions
Abdul Hameed and Abdul Khalique Solangi

1520 Discussion

1540 TEA & ADJOURNMENT

12 April (Monday)

0815 Recitation from the Holy Quran

Technical Session III

ROLE OF WATER USERS IN IRRIGATION MANAGEMENT

Chairman: Mr. John B. Swanson
Rapporteur: Mr. D. T. Bandaragoda

0820 Potential Role of Water User Associations for Sustainability of Agriculture: Synthesis of Nine Studies
Bashir Ahrned Chandio, Abdul Majeed, and Mohammed Azam

0840 Pre-project Socioeconomic Study at Qadirabad and Swat Research Sites
Munir Ahmed Bhatti, Zafar Iqbal Khan and Arshad Mahmood

0900 Discussion

0920 19
Technical Session IV:

**DRAINAGE AND WATER TABLE CONTROL**

Chairman: Mr. Jalil U. Ahmed  
Rapporteur: Dr. Abdul Majeed

0940 Comparative Effect of Organic, Inorganic and Biological Material on Reclamation of Saline Sodic Soils Under Tile Drainage System  
Mohammad Haroon Chang, Moula Bux Mirbahar and Mohammad Khan Marri

1000 Collaborative Tile Drainage System: Key to Solve Waterlogging and Salinity Problems  
Moula Bux Mirbahar, Mohammad Khan Marri, and Mohammad Haroon Chang

1020 Effect of Drain Positions and Boundary Conditions on Seepage Interception Using Galerkin Finite Element Model  
Bashir A. Chandio, Abdul Samad Chandio and Arshad M. Sheikh

1040 Discussion

1100

1100 T E A

1120

Technical Session V:

**GROUNDWATER AND PHYSICAL HYDRAULIC MODELING**

Chairman: Mr. F. A. Zuberi  
Rapporteur: Dr. Mohammad Nadeem

1120 Estimation of Hydrologic Parameters for Regional Groundwater Models  
Javed Zaman

1140 An Appraisal of Groundwater Pollution in Allahabad Unit, SCARP-VI  
Javed Zaman

20
1200  Interaction of Saline and Fresh Water Zones in Allahabad Unit, SCARP-VI
      Farhat Zaman and Mohammed Nadeem

1220  Physical Modeling of Sediment Ejectors for the Jamrao Canal and Effect of Downstream Glacis Slope on Scour
      Mohammad Khan Memon and Shamim-ud-din Ahmed

1240  Discussion
1300

1300  LUNCH & PRAYERS
1420

Technical Session VI:

USE OF DATABASE AND PUBLIC TUBEWELL PERFORMANCE

Chairman:  Mr. Ishaq Khan Niazi
Rapporteur:  Mrs. Zaigham Habib

1420  Classification of SCARP Tubewells in the Database by Their Characteristics and Performance Record
      Parvez Arif

1440  Factors Associated with Deterioration of SCARP Tubewells
      Mohammad Memon and Parvez Arif

1500  Groundwater Quality Changes in Allahabad Unit, SCARP-VI
      Imtiaz Ali, Javed Zaman and Mohammed Nadeem

1520  Evaluation of Mechanical and Air Surging in Wells with Fiberglass Casing
      Mohammad Memon

1540  Discussion
1600

TEA & ADJOURNMENT
13 April (Tuesday)

0815  Recitation from the Holy Quran

Technical Session VII:

IMPROVING ON-FARM WATER USE AND APPLICATION

Chairman:  Mr. Mushtaq Gill
Rapporteur: Mr. Marcel Kuper

0820  Innovative Surface irrigation Methods for Orchards
       Muhammad Yasin, Shahid Ahmad, M. Munir Ahmad and Asif Ali Bhatti

0840  Level Border Irrigation Layout and Evaluation in Pakistan
       Arshad Ati, Badruddin, M. Jamal and Nisar A. Memon

0900  Level Borders Irrigation Efficiency Under Different Soil Surface Conditions
       Badruddin, M. Jamal Khan and Arshad Iqbal

0920  Benefits of Supplemental Irrigation for Wheat in Barani Environment
       Asif Ali Bhatti, M. Munir Ahmad, P. M. Moshabbir and Shahid Ahmad

0940  Design and Local Manufacturing of Portable Raingun Sprinkler Irrigation Systems
       Shahid Ahmad, P. M. Moshabbir, Asif Ali Bhatti and M. Yasin

1000  Indigenization of Trickle Irrigation Technology
       P. M. Moshabbir, Shahid Ahmad, M. Yasin and M. Munir Ahmad

1020  Discussion

1040

1040  T E A

1100
Technical Session VIII:

IRRIGATION SYSTEMS OUTSIDE THE INDUS BASIN

Chairman: Mr. Muhammad Munir
Rapporteur: Dr. Carlos Garces-Restrepo

1100 Effect of Karez Improvements and Future Plan of Balochistan
Ijaz Ahmad Humayun and Mushtaq Ahmad

1120 Delay-action Dams in Ziarat - An Estimation of Economic Impact
Muhammad Khalil

1140 Advance Irrigation Application Techniques and Their Use in Balochistan
Mushtaq Ahmad

1200 Effect of Brackish Water and Phosphorus on Yield of Onion
Riaz Ahmad

1220 Discussion
1240

1240 LUNCH & PRAYERS
1400

Technical Session IX

IRRIGATION MANAGEMENT RESEARCH AGENDA OF PAKISTAN FOR THE FUTURE

Chairmen: Dr. Zafar Altaf
Mr. Abdul Hafeez Qaiser
Rapporteur: Mr. M. Badruddin

1400 Research Insights Learned from the ISM/R Project
Senen M. Miranda

1415 Irrigation Management Research Agenda: View from PCRWR
Bashir Ahmed Chandio

1430 Irrigation Management Research Agenda: View from WAPDA
Muhammad Munir

1445 Irrigation Management Research Agenda: View from PARC
Shahid Ahmad
1500 irrigation management research agenda: global view from ilmi
jacob w. kijne

1515 discussion
1545

closing session

1555 recitation from the holy quran

1600 comments by the project officer, ism/r
mr. jalil u. ahmed

1615 comments by the chairman, ca planning and review committee
mr. javed saleem qamar

1630 symposium wrap-up
dr. senen m. miranda

1645 vote of thanks
mr. d. t. bandaragoda, acting director, iimi-pakistan

tea & adjournment